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PRIORITY APPLICATION

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**Flexible press cover and shoe press roll with such a  
flexible press cover**

The present invention relates to a flexible press cover  
5 which is intended for a shoe press roll. A shoe press  
roll of this type is used for dewatering or calendering  
a moving fibrous web, in particular a paper or board  
web. The flexible press cover comprises a plastic  
layer, preferably made of polyurethane and, as a  
10 strengthening means, a ("conventional") reinforcement  
embedded in the plastic layer. The reinforcement can  
be formed as a woven fabric; however, preference is  
given to what is known as a laid fabric, which  
comprises axially parallel longitudinal filaments and  
15 circumferential filaments wound in. The circumferential  
filaments can be wound into the plastic layer on the  
outer side of the longitudinal filaments (see EP  
0330680 = US 5134010, PH 04378). However, the opposite  
arrangement is likewise possible (see WO 95/29293,  
20 Tamfelt).

In relation to the prior art, reference is made to the  
following further documents:

- 25 D1: DE 3546650 C2, (PH 04164A),  
D2: DE 29702362, (PH 10287),  
D3: DE 19633543 (PH 10368).

As is known, a shoe press roll comprises a stationary  
30 supporting element. Rotatably mounted on the latter  
are two cover carrying disks for the flexible press  
cover. In addition, there is arranged on the  
supporting element a radially displaceable press shoe,  
which is able to press the revolving press cover  
35 against an opposing roll in order to form a press nip  
extended in the web running direction. It is important  
that the press cover and the cover carrying disks,

together with the supporting element, bound a closed, liquid-tight internal space.

5 According to document D1, in order to achieve a liquid-tight connection between the press cover end region and one of the cover carrying disks, provision is made to bend over the end region radially inward and to press it against the outer end of the cover carrying disk with the aid of clamping elements.

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This arrangement has been tried and tested in practice. However, it is disadvantageous in that a large number of recesses has to be provided in the edge zone of the press cover, between which recesses tongues remain. In 15 some cases, difficulties also arise in achieving the most exact circularity of the press cover.

According to figures 3 and 4 of document D2, attempts have been made to avoid the deformation of the press 20 cover end region described in D1. Each of the two press cover end regions retains the normal cylindrical form, so that the production of recesses and tongues is dispensed with. Provision is made to clamp the cylindrical press cover end region in between an 25 internal expandable (that is to say of enlargeable diameter) spreader ring and an outer ring. However, such an outer ring is frequently disruptive, since the replacement of a worn press cover by a new press cover is more awkward.

30

According to figures 2 to 4 of document D3, an annular circumferential groove is provided in the outer circumferential surface of a cover carrying disk, into which groove the annular region of the press cover is 35 pressed, specifically by means of a clamping band or by means of a plurality of turns of a high-strength filament or by means of a shrinkage ring. If a covering provided in accordance with figure 1 is left

out, then there is no disruptive outer ring. Nevertheless, this known solution has not been able to gain acceptance in practice.

- 5 The present invention is based on the object of further developing a flexible press cover of the design mentioned at the beginning in such a way that as many as possible of the following requirements are satisfied:
- 10
- a) the production of recesses and tongues in the press cover end region should be superfluous;
  - b) the mounting of the press cover end region on the  
15 respective cover carrying disk should be able to be performed with the least possible effort; if the mounting operation is carried out within the papermaking machine, account must be taken of the fact that the mounting space which is available at  
20 the two roll ends is often very restricted;
  - c) the most precise circularity of the finally mounted press cover should be achievable;
  - 25 d) the outer circumferential surface of the press cover should be free of fixing elements, for example outer rings.

30 According to the invention, this object is achieved in principle in that the flexible press cover has an additional strengthening means in at least one of its two end regions. As a result, in the end region, the tensile strength and the tensile rigidity in the circumferential direction are increased with respect to  
35 that hitherto in such a way that it is no longer necessary to clamp the press cover end region in between two components. Instead, the press cover according to the invention is suitable to be fixed to

the outer circumferential surface of a rotatable supporting element belonging to the cover carrying disk without the aid of an outer ring, a clamping band, clamping filament or the like (claim 1). In the most  
5 beneficial case, the arrangement for fixing the press cover to the aforementioned supporting element is completely free of any kind of fixing elements which would be associated with the cover outer surface (claim 2).

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By virtue of the invention, it is possible to achieve a number of advantages: the form of the press cover end region remains completely or at least approximately cylindrical. In other words: during the mounting of  
15 the press cover, deformation of the press cover end region is not necessary; the necessity of producing recesses and tongues is thus also dispensed with. The joining of the press cover end region to a radially outer part or region of the cover carrying disk can be  
20 carried out in the same way or at least in a very similar way as the joining of two metal components.

Thus, the mounting of the press cover on the cover carrying disks can be carried out in a simpler way than  
25 hitherto, namely with less effort than hitherto, so that, if required, even an unpracticed person can be entrusted with the mounting work. A further important advantage is that no outer ring (rotating with the press cover) is required. Likewise, the clamping  
30 elements required in accordance with D1 are omitted; this makes it easier to work in restricted conditions of space within the papermaking machine.

The press cover end region advantageously has a  
35 constant thickness, measured along axially parallel envelope lines. As a rule, on a finally mounted press cover; not only the outer circumferential surface but also the inner circumferential surface of the press

cover end region (having the additional strengthening) are therefore cylindrical (claim 3). However, a departure from this can be made if required. Specifically, it may be advantageous to design the inner circumferential surface of the press cover end region to be slightly conical, with an internal diameter which increases outward or inward (claim 4). The fixing of the press cover end region to any kind of annular supporting element belonging to the cover carrying disk (or directly to the carrying disk) can be made easier hereby. In both cases, it can be advantageous to provide a supporting element of which the diameter can be enlarged, that is to say can be spread (claim 5). However, the use of a non-spreadable ring is also possible, for example a mounting ring, which is inserted into a new press cover to be retrofitted outside the shoe press roll (see DE 101 38 527.7).

According to claims 6 to 32, the invention can be applied in flexible press covers with different conventional reinforcements, in particular with woven fabric or laid fabric reinforcement. In claims 6 to 32, different embodiments of the additional strengthening are also specified; this can be formed as an additional or strengthened reinforcement. As an alternative to this or in addition, materials with a modulus of elasticity that is higher in the circumferential direction can be used. One further possibility is for a strengthening ring to be integrated into at least one of the press cover end regions. The object of all these measures is to reduce the extensibility in the circumferential direction of the press cover end region as compared with that hitherto.

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According to claims 33 to 41, protection is also claimed for a complete shoe press roll having a flexible press cover formed in accordance with the

invention. In this case, at least one of the two cover carrying disks can be adapted in one way or another to the press cover end region formed in accordance with the invention. Details are explained further below within the context of the figure description.

Exemplary embodiments of the invention are described below using the drawing.

Figure 1 is a partial longitudinal section through a shoe press roll having a flexible press cover according to the invention.

Figure 2 is a partial view of a spreader ring belonging to the shoe press roll.

Figures 3 to 6 show variants of figure 1.

Figures 7 to 13 show various modifications of the press cover end region in longitudinal section.

Figure 14 shows the method of producing a press cover on the outer circumferential surface of a cast cylinder.

Figure 15 shows the press cover produced in accordance with figure 14 in the finally mounted state.

Figures 16 shows a further variant of a shoe press roll having a flexible press cover according to the invention.

Figure 1 shows, of a shoe press roll, only one of the two end regions of the flexible press cover 10 and its fixing to a rotatable cover carrying disk 20. The latter is mounted in a known way on a supporting element, not visible, by means of a rolling contact bearing 21. Likewise not illustrated is a press shoe, using which the press cover 10 can be pressed against an opposing roll. These and further known details of a

shoe press device can be seen, for example, from DE 19522761 (PH 10178).

5 The press cover 10 is substantially composed of a plastic layer 30, for example of polyurethane, with a conventional reinforcement embedded therein as a strengthening means; said reinforcement comprises, in a known way, axially parallel longitudinal filaments 31 and circumferential filaments 32 wound thereon. The  
10 thickness d of the press cover 10 is chosen such that grooves or blind holes 33 can be provided within the pressing zone P. In the end region E, the press cover 10 has substantially the same thickness d as in the pressing zone P. In the end region E, as additional  
15 strengthening (that is to say in addition to the conventional reinforcement 31, 32), additional circumferential filaments 34 of the highest possible tensile strength and tensile rigidity (high modulus of elasticity) are embedded in the plastic layer 30.

20 According to the invention, said circumferential filaments 34 form an additional reinforcement, produced from high-strength plastic or metal filaments or wires. As compared with the circumferential filaments 32 of  
25 the conventional reinforcement, the additional circumferential filaments or wires 34 can have a larger filament diameter and/or be formed from a material which has a higher tensile strength and, in particular, a higher modulus of elasticity (e.g. Kevlar). However,  
30 it is also possible to choose the same diameter and/or the same material for the filaments 32 and 34, preferably a material with a relatively high modulus of elasticity. In addition, the plastic layer can be formed from a material with an increased modulus of  
35 elasticity. Between the end region E and the pressing zone P, the press cover 10 can have a zone of lower thickness, in order to increase its flexibility



precisely where increased deformation takes place during operation.

The cover carrying disk 20 comprises an integrally  
5 molded collar 22 and an extension ring 23 screwed to  
the latter. Collar 22 and ring 23 engage around the  
rolling contact bearing 21 and, on their outer side,  
bear an axially displaceable clamping ring, which is  
formed as an annular piston 24. The three  
10 aforementioned components 22, 23 and 24 are shaped in  
such a way that an annular space 25, to which a  
pressurized medium can be applied, is formed between  
them. As a result, the annular piston 24 can be  
displaced outward hydraulically or pneumatically  
15 parallel to the roll axis. Sealing rings 26 are used  
to seal off the annular space 25.

In order to connect the press cover 10 to the cover  
carrying disk 20, a spreader ring 27 is provided. The  
20 latter has a cylindrical outer circumferential surface,  
provided with recesses if required, which engages in  
the cylindrical inner circumferential surface of the  
press cover end region E. The spreader ring 27 has a  
conical inner circumferential surface, which interacts  
25 with a conical outer circumferential surface of the  
annular piston 24. In the event of axial displacement  
of the annular piston 24 (to the left in figure 1), the  
spreader ring 27 (which bears axially on the cover  
carrying disk 28) is widened, and therefore a secure,  
30 liquid-tight connection is made between the press cover  
10 and the cover carrying disk 20. By virtue of the  
additional reinforcement 34, an external clamping link  
is no longer required in the press cover end region.

35 The axial displacement of the annular piston 24 can  
also be carried out with the aid of screws (indicated  
at 28). Screws 28 of this type can also be used for  
the axial fixing of the annular piston 24 after the

annular piston has been displaced hydraulically or pneumatically. Figure 2 shows the spreader ring 27 from the outside. This ring is given its ability to spread by slots 29 machined in alternately from both sides, in which a highly elastic filler is provided, in order that the necessary hermetic sealing of the roll internal space is ensured.

Figure 3 differs from figure 1 in that, in the end region E on the press cover 10', provision is made for a bead 30A projecting radially inward, which fits into a turned recess in the spreader ring 27'. In this way, the accuracy of the axial fixing of the press cover 10' to the carrying disk 20 is increased.

The press cover 10A of the exemplary embodiment illustrated in figure 4 is virtually identical with that of figure 1; only the length E' of the press cover end region has been enlarged somewhat, corresponding to the greater axial length of the spreader ring 27A. The cover carrying disk 20A again has a collar 22A to accommodate the rolling contact bearing 21. Between the collar 22A and the spreader ring 27A there is a simple clamping ring 24A. The latter is displaced axially in the outward direction merely with the aid of screws 28, enlarging the outer diameter of the spreader ring with its conical outer circumferential surface, which interacts with a conical inner circumferential surface of the spreader ring 27A, in order to produce a secure connection to the press cover 10A. Integrally molded on the spreader ring 27A is a collar 27B, which again makes the accurate axial fixing of the press cover to the carrying disk 20A easier.

In a shoe press roll according to the invention, both ends of the roll can be constructed in accordance with figure 1. Another possibility is for one end of a shoe press roll to be configured in accordance with figure 1

or figure 3, but, on the other hand, for the other end of the roll to be figured in accordance with figure 4 or in accordance with figures 5 or 6 described below.

- 5 The press cover 10B of the exemplary embodiment illustrated in figure 5 differs from the press cover 10A of figure 4 only in the fact that the inner circumferential surface in the end region is not continuously cylindrical but is slightly conical a  
10 short distance from the outside, with an internal diameter that decreases from the outside toward the inside.

This makes it easier to insert a mounting ring 40,  
15 which has a corresponding conical outer circumferential surface. The insertion of this ring 40 (and the fixing of the same in the press cover 10B, for example by means of adhesive) is preferably carried out outside the shoe press roll, that is to say before the removal  
20 of a press cover that has worn and is to be replaced. For fixing the mounting ring 40 bearing the press cover 10B to the cover carrying disk 20B, the following is provided; the outer circumferential surface of the cover carrying disk 20B is offset at 41. The inner  
25 circumferential surface of the strengthening ring 40 has a corresponding offset, in the example illustrated, a relatively small internal diameter D being followed by a larger internal diameter in the axial direction from the inside to the outside. In this way, the press  
30 cover 10B, together with the pre-mounted mounting ring 40, can be pushed onto the cover carrying disk 20B in the direction of the arrow P over the entire (not illustrated) stationary supporting element. This is possible by virtue of the fact that the aforementioned  
35 relatively small internal diameter D of the ring 40 is still somewhat larger than the external dimensions of the stationary supporting element, including the press shoe and further accessories. In order to screw the

ring 40 to the cover carrying disk 20B, the following is provided: a bush 42 is rotatably mounted in a bore in the cover carrying disk 20B. Integrally molded at the inner end of the bush 42 is a nose flange 43; a radial pin 44 is inserted into the outer end. In the illustrated position of the bush 42, the nose of the nose flange 42 acts on the inner end of the ring 40. However, as a result of rotation of the bush 42, the nose permits the strengthening ring to pass when inserted in the direction of the arrow P. In order to fix the mounting ring 40 (together with the press cover 10B) to the cover carrying disk 20B with the aid of the aforementioned nose flange 43, a screw 28 is provided. It goes without saying that a plurality of such arrangements are distributed over the circumference of the cover carrying disk 20B.

Figure 6 shows a simplified alternative to figure 5. The mounting ring 40' here has a smooth inner circumferential surface (without the offset 41 shown in figure 5); in addition, the bush 42 has been omitted. The mounting ring 40' is screwed to the cover carrying disk 20' by means of simple studs 45. In this design, however, a smaller internal diameter D' of the mounting ring 40' will generally be needed than in figure 4. In order that, as the press cover is drawn in, the mounting ring 40' can nevertheless pass the stationary supporting element with its accessories, it may be necessary to arrange some of these accessories such that they can move on the supporting element; see the parallel patent application DE 101 38 527.7

For fixing the press cover 10C to the mounting ring 40', the following is provided: the mounting ring has a conical outer circumferential surface that tapers in the outward direction. In addition, in the press cover end region E'', the circumferential filaments 32A and/or 34A are wound in with increased prestress, so

that the end region E'' likewise tapers conically in the outward direction. The press cover 10C is fixed onto the mounting ring 40' in a manner similar to the fixing of a vehicle tire to its rim.

- 5 The press cover design with circumferential filaments wound in under increased prestress can also be combined with a mounting ring whose outer circumferential surface is cylindrical.
- 10 Figure 7 shows a press cover 11 which is modified with respect to figure 1 and whose conventional reinforcement (differing from figure 1) has axially parallel longitudinal filaments 35 arranged outside the circumferential filaments 32 (corresponding to
- 15 WO '293). As additional reinforcement, circumferential filaments 36 are provided, which are preferably wound onto the conventional reinforcement 32, 35 from the inside. As an alternative to this or in addition, in order to strengthen the press cover end region further,
- 20 circumferential filaments 36' which are wound onto the conventional reinforcement 32, 35 from the outside can be provided.

The press cover 12 illustrated in figure 8 has, as conventional reinforcement, a woven fabric 37. As

25 additional reinforcement of the press cover end region, circumferential filaments 38 are provided, which are wound onto the woven fabric 37 from the outside. Alternatively to this or additionally, circumferential filaments 38' arranged radially on the inside can be

30 provided.

In the exemplary embodiments according to figures 7 and 8, both press cover end regions can be designed identically. By contrast, the variant illustrated in

35 figure 9 can be provided only at one of the two press cover ends. This results from the production method according to EP 0330680 (production of the press cover on the outer side of a cast cylinder). In detail,

figure 9 shows a press cover 13 whose conventional reinforcement 31, 32 corresponds to that of the press cover 10 illustrated in figure 1. The illustrated end region of the press cover 13 has, in a way similar to figure 3, a thickening 30A projecting radially inward. Located in this is an additional reinforcement, which can be formed as a woven fabric or (as illustrated) as a laid fabric, comprising axially parallel longitudinal filaments 39 and circumferential filaments 39' wound thereon. In addition, a thickening (not illustrated) projecting radially outward can be provided, similar to that of figure 1 or 3.

Figure 10 shows a press cover 50 according to the invention whose end region has no thickening. Here, the additional strengthening is formed by the circumferential filaments 32' being wound more densely in the end region than the circumferential filaments 32 located outside the end region. The circumferential filaments 32 and 32' can consist of the same material. As an alternative to this, the circumferential filaments 32' can also be formed from a material with an increased modulus of elasticity. In addition, in the end region, the plastic layer 30 can be produced from a material with an increased modulus of elasticity.

Figures 11 to 15 show embodiments of the press cover according to the invention in which a strengthening ring (of plastic or metal) is integrated into the end region of the press cover as additional strengthening. According to figure 11, the thickness d of the axially outer region 52 of the strengthening ring 51 is substantially the same as or greater than the thickness of the end region E of the press cover 10 of figure 1. The axially inner region 53 is substantially thinner and overlaps the end of the press cover 54, initially produced in the conventional way (EP' 680), with its

- conventional reinforcement 31, 32. The ring 51 is fixed by casting on an additional plastic layer 55 and winding in additional circumferential filaments 56 at the same time. The press cover 54 is fixed to the cover carrying disk in the same way as in figure 1 or 4 or by means of screws which engage directly in the strengthening ring 51 in the axial direction (see threaded hole 59).
- Figure 12 differs from figure 11 in that the strengthening ring 51A is thinner in its axially outer region than the thickness d of the finished press cover end region, and in that it is sheathed over its entire length by the additional plastic layer 55A with additional circumferential filaments 56.

Figure 13 shows the end region of a press cover 60 produced in accordance with WO '293 with strengthening ring 61. Illustrated schematically is a cast cylinder 62 with its inner circumferential surface 63. Firstly, during the production of the press cover 60, the strengthening ring 61 fixed to the cast cylinder 62 is used to clamp the longitudinal filaments 64 on. The plastic layer 65 is then cast, the circumferential filaments 66 simultaneously being wound from the inside onto the longitudinal filaments 64 and the strengthening ring 61. In order to fix the press cover 60 to a cover carrying disk (not illustrated), the strengthening ring 61 has a flange 67 projecting radially inward. Alternatively, a flange 68 projecting radially outward could be provided.

Figure 14 shows the production method of a press cover 70 with strengthening rings 71 and 72. The production method corresponds to that of EP '680, with a cast cylinder 73 on whose circumferential outer surface the production takes place. Differing from EP '680, instead of clamping rings, the strengthening

rings 71 and 72 are provided, which are used initially to clamp the longitudinal filaments 74 on and which, after the plastic layer 75 has been cast on and the circumferential filaments 76 have simultaneously been wound on, remain a constituent part of the press cover 70. The secure fixing of the strengthening rings 71 and 72 in the press cover 70 is achieved by the longitudinal filaments 74 (as disclosed by EP '680) being drawn in a meandering fashion through the strengthening rings 71, 72 and then being tensioned, additionally by the fact that the circumferential filaments 76 are wound onto the strengthening rings with a certain prestress. Figure 14 also shows how the casting nozzle 77 moves from one end of the cast cylinder 73 to the other during the casting operation, while said cylinder rotates at the same time.

One strengthening ring 71 has a flange 71a projecting radially inward, which bears on one end of the cast cylinder 73. The other strengthening ring 72 has a flange 72a projecting radially outward, in which clamping screws 78 engage in order to tension the longitudinal filaments 74.

Figure 15 shows the press cover 70 produced in accordance with figure 14 in the finished state mounted on cover carrying disks 79 and 80. In this case, the flanges 71a and 72a are used for fixing the press cover to the carrying disks, in each case with the aid of screws 81, 82. Each of the two strengthening rings 71, 72 is centered on an outer circumferential surface of its cover carrying disk. In order to make it easier to draw in the press cover 70 in the axial direction (arrow P), the diameter of the outer circumferential surface of the carrying disk 79 on the left (in figure 15) is smaller than that of the right-hand carrying disk 80. Accordingly, the cast cylinder 73 in figure 14 is offset slightly at 83.



In the case of the press cover 14 illustrated in figure 16 (whose conventional reinforcement is not illustrated), additional strengthening is formed as an end section 16 of the press cover which is folded inward (or turned over). Additional reinforcement 15 is provided therein. As figure 16 shows, the inner circumferential surface of the inwardly folded end section 16 is conical with an internal diameter increasing in the inward direction. As a result, the press cover 14 is fixed to the cover carrying disks 20C and 20D in a manner similar to the fixing of a vehicle tire to a rim. One press cover end section preferably rests directly on the cover carrying disk 20D, which has a corresponding conical outer circumferential surface. The other end section rests on a clamping ring 17, which likewise has a corresponding conical outer circumferential surface and which can be displaced in an axially parallel manner on the cover carrying disk 20C. A plurality of ring segments 18 can be inserted into the cover carrying disk 20C in the radial direction from the outside to the inside. Through said segments there extend screws 19, using which the press cover end section can be clamped in between the clamping ring 17 and the ring segments 18.

## Patent claims

1. A flexible press cover (10), which is intended for  
a shoe press roll - used for dewatering or  
5 calendering a moving fibrous web - and which has a  
plastic layer (30) and, as a strengthening means,  
a "conventional" reinforcement (31, 32) embedded  
therein, characterized in that, at least in one of  
its two end regions (E), the press cover (10) has  
10 an additional strengthening means (34), which  
makes the press cover suitable to be fixed to a  
rotatable supporting element (e.g. spreader ring  
27) of the shoe press roll, preferably on the  
outer circumferential surface of the supporting  
15 element.
2. The flexible press cover as claimed in claim 1,  
characterized in that the arrangement for fixing  
the press cover (10) to the aforementioned  
20 supporting element (27) is free of fixing elements  
associated with the circumferential outer surface.
3. The flexible press cover as claimed in claim 1 or  
2, characterized in that the inner circumferential  
25 surface of the press cover end region E having the  
additional strengthening (34) is cylindrical.
4. The flexible press cover as claimed in claim 1 or  
2, characterized in that the inner circumferential  
30 surface of the press cover end region having the  
additional strengthening (34) is conical, with an  
internal diameter that increases or decreases in  
the outward direction (figure 5 and, respectively,  
6).
- 35 5. The flexible press cover as claimed in claim 3 or  
4, characterized in that the aforementioned  
supporting element (27, 27A) can be spread, that

is to say enlarged in diameter, as known per se (figures 1 - 4).

- 5 6. The flexible press cover as claimed in one of claims 1 to 5, whose conventional reinforcement has a woven fabric (37) or a "laid fabric", the laid fabric comprising axially parallel longitudinal filaments (31) and circumferential filaments (32), characterized in that the additional strengthening is formed as an additional reinforcement (34; 36; 38; 39').
- 10 7. The flexible press cover as claimed in claim 6, characterized in that the additional reinforcement has circumferential filaments (34; 38) which are wound onto the conventional reinforcement from the outside.
- 15 8. The flexible press cover as claimed in claim 6 or 7, characterized in that the additional reinforcement has circumferential filaments (36) which are wound onto the conventional reinforcement (32, 35) from the inside (figure 7).
- 20 9. The flexible press cover as claimed in one of claims 1 to 8, characterized in that the additional strengthening, preferably in only one of the two end regions of the press cover (13), comprises a thickened bead (30A) whose internal diameter is smaller than the internal diameter of the remaining press cover (figures 3, 9).
- 25 30 9. The flexible press cover as claimed in one of claims 1 to 8, characterized in that the additional strengthening, preferably in only one of the two end regions of the press cover (13), comprises a thickened bead (30A) whose internal diameter is smaller than the internal diameter of the remaining press cover (figures 3, 9).
- 30 10. The flexible press cover as claimed in claim 9, characterized in that an additional reinforcement is provided in the bead (30A), for example axially parallel longitudinal filaments (39) and circumferential filaments (39') wound thereon (figure 9) or a woven fabric.
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11. The flexible press cover as claimed in one of  
claims 1 to 8, characterized in that the  
additional strengthening is formed of additional  
circumferential filaments (32') which form a  
continuation of the conventional circumferential  
filaments (32), for example with increased winding  
density and/or increased filament thickness  
(figure 10).
12. The flexible press cover as claimed in claim 6,  
characterized in that the additional reinforcement  
has at least one band, for example a woven fabric  
band.
13. The flexible press cover as claimed in one of  
claims 1 to 12, characterized in that the end  
region (E) having the additional strengthening  
(34) has a greater thickness (d, figure 1) than  
the adjacent press cover region.
14. The flexible press cover as claimed in claim 1 or  
2, characterized in that the additional  
strengthening is formed as an end section (16) of  
the press cover (14) which is folded inward.
15. The flexible press cover as claimed in claim 14,  
characterized in that an additional reinforcement  
(15) is provided in the end section (16).
16. The flexible press cover as claimed in claim 14 or  
15, characterized in that the inner  
circumferential surface of the end section (16)  
that is folded inward is conical with an internal  
diameter that increases in the inward direction.
17. The flexible press cover as claimed in claim 14 or  
15, characterized in that the end section that is

folded inward has a substantially cylindrical inner circumferential surface.

- 5 18. The flexible press cover as claimed in one of claims 1 to 5, characterized by an additional strengthening means, which is formed by at least one of the materials used for a press cover end region (E) having a higher modulus of elasticity in the circumferential direction as compared with  
10 the materials of the remaining press cover regions.
- 15 19. The flexible press cover as claimed in claim 18, characterized in that the reinforcement of the end region (E), in particular the circumferential filaments (32'), have an increased modulus of elasticity which is at least 15 000 MPa, preferably at least 25 000 MPa.
- 20 20. The flexible press cover as claimed in claim 18 or 19, characterized in that, in the end region (E), the plastic layer (30) has an increased modulus of elasticity which is at least 200 MPa.
- 25 21. The flexible press cover as claimed in one of claims 1 to 5, characterized by an additional strengthening means, which is formed by at least one of the materials used in the entire press cover having an increased modulus of elasticity in  
30 the circumferential direction.
- 35 22. The flexible press cover as claimed in claim 21, characterized in that the circumferential filaments (32) have an increased modulus of elasticity which is at least 15 000 MPa, preferably at least 25 000 MPa.

23. The flexible press cover as claimed in one of claims 6 to 17, characterized in that, in the additional reinforcement, the circumferential filaments (34; 36; 38; 39') have an increased modulus of elasticity which is at least 15 000 MPa, preferably at least 25 000 MPa.
24. The flexible press cover as claimed in one of claims 1 to 5, characterized by an additional strengthening means which is formed in that, in the least one end region (E''), circumferential filaments (32A) are wound in with increased prestress, in the manner of reinforced concrete (figure 6).
25. The flexible press cover as claimed in claim 24, characterized in that the end region (E'') tapers conically in the outward direction.
26. The flexible press cover as claimed in claim 24 or 25, characterized in that circumferential filaments (34A) of an additional reinforcement are also wound in with increased prestress.
27. The flexible press cover as claimed in one of claims 1 to 6, characterized in that the additional strengthening means has a strengthening ring (51; 51A; 61; 71, 72) prefabricated from a plastic or a metal.
28. The flexible press cover as claimed in claim 27, characterized in that, as viewed in cross section through the strengthening ring, at least part of the strengthening ring is cast into the press cover.
29. The flexible press cover as claimed in claim 28, characterized in that the strengthening ring is

anchored in the press cover with the aid of reinforcing filaments (56; 64, 66; 74, 76).

30. The flexible press cover as claimed in claim 28 or  
5 29, characterized in that the strengthening ring (51, 51A) is cast in following the casting of the conventional plastic layer.
31. The flexible press cover as claimed in claim 28 or  
10 29, characterized in that the strengthening ring (61; 71, 72) is cast in at the same time as the conventional plastic layer is cast.
32. The flexible press cover as claimed in one of  
15 claims 27 to 31, characterized in that the strengthening ring has a flange (67 or 68 or, respectively, 71a, 72a) for fixing the press cover to a rotatable supporting element (for example a cover carrying disk 79, 80) belonging to the shoe  
20 press roll.
33. A shoe press roll, which comprises a flexible press cover constructed in accordance with one of claims 1 to 32 and which, at each end of the roll,  
25 has a rotatable cover carrying disk (20) which is mounted on a stationary supporting element, characterized by the following features:
- a) at least one of the cover carrying disks (20) comprises a clamping ring (24 or 24A) which can  
30 be displaced axially on an outer circumferential surface of the cover carrying disk;
  - b) the clamping ring has a conical outer surface which engages in a conical inner surface of a  
35 ring (27 or 27A) that can be spread;
  - c) the ring that can be spread rests in the cover inner surface of the press cover end region (E) having the additional strengthening (34);

d) the arrangement is free of fixing elements associated with the press cover outer circumferential surface.

- 5 34. The shoe press roll as claimed in claim 33, characterized in that the clamping ring (24A) can be displaced axially by means of screws (28).
- 10 35. The shoe press roll as claimed in claim 33, characterized in that the clamping ring (24) can be displaced axially by means of a hydraulic pressure chamber (25), as known per se.
- 15 36. The shoe press roll as claimed in one of claims 33 to 35, characterized in that the spreader ring (27A) has a collar (27B) for the axial fixing of the press cover (figure 4).
- 20 37. The shoe press roll according to the preamble of claim 33, characterized in that, at at least one of the ends of the roll, in order to connect the press cover (10B; 10C) to the cover carrying disk (20B; 20'), a mounting ring (40, 40') is provided which, outside the press roll, can be inserted  
25 into the press cover end having additional strengthening (34, 34A) and, after that (together with the press cover), can be fixed to the cover carrying disk (figures 5, 6).
- 30 38. The shoe press roll as claimed in claim 37, characterized in that the aforementioned mounting ring (40, 40') has a conical outer circumferential surface matching a conical inner circumferential surface of the press cover end region having the  
35 additional strengthening (34; 34A).
39. The shoe press roll as claimed in claim 37, characterized in that the mounting ring has a



substantially cylindrical outer circumferential surface.

- 5      40. The shoe press roll as claimed in one of claims 37 to 39, characterized in that the mounting ring (40') can be inserted into an end region of the press cover which is tapered conically outward (as claimed in claim 25 or 26) (figure 6).
- 10    41. The shoe press roll as claimed in one of claims 37 to 40, characterized in that the mounting ring (40, 40') has a collar for the axial fixing of the press cover.

## Patent claims

1. A flexible press cover (10), which is intended for  
a shoe press roll - used for dewatering or  
5 calendering a moving fibrous web - and which has a  
plastic layer (30) and, as a strengthening means,  
a "conventional" reinforcement (31, 32) embedded  
therein, a woven fabric (37) or a "laid fabric",  
the laid fabric comprising axially parallel  
10 longitudinal filaments (31) and circumferential  
filaments (32), characterized in that, at least in  
one of its two end regions (E), the press cover  
(10) has an additional strengthening means (34) in  
the form of an additional reinforcement (34, 36,  
15 38, 39'), which makes the press cover suitable to  
be fixed to a rotatable supporting element (e.g.  
spreader ring 27) of the shoe press roll,  
preferably on the outer circumferential surface of  
the supporting element.  
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2. The flexible press cover as claimed in claim 1,  
characterized in that the arrangement for fixing  
the press cover (10) to the aforementioned  
supporting element (27) is free of fixing elements  
25 associated with the circumferential outer surface.
3. The flexible press cover as claimed in claim 1 or  
2, characterized in that the inner circumferential  
surface of the press cover end region E having the  
30 additional strengthening (34) is cylindrical.
4. The flexible press cover as claimed in claim 1 or  
2, characterized in that the inner circumferential  
surface of the press cover end region having the  
35 additional strengthening (34) is conical, with an  
internal diameter that increases or decreases in  
the outward direction (figure 5 and, respectively,  
6).

5. The flexible press cover as claimed in claim 3 or 4, characterized in that the aforementioned supporting element (27, 27A) can be spread, that is to say enlarged in diameter, as known per se (figures 1 - 4).
6. The flexible press cover as claimed in one of claims 1 to 5, characterized in that the additional reinforcement has circumferential filaments (34; 38) which are wound onto the conventional reinforcement from the outside.
7. The flexible press cover as claimed in one of claims 1 to 6, characterized in that the additional reinforcement has circumferential filaments (36) which are wound onto the conventional reinforcement (32, 35) from the inside (figure 7).
8. The flexible press cover as claimed in one of claims 1 to 7, characterized in that the additional strengthening, preferably in only one of the two end regions of the press cover (13), comprises a thickened bead (30A) whose internal diameter is smaller than the internal diameter of the remaining press cover (figures 3, 9).
9. The flexible press cover as claimed in claim 8, characterized in that an additional reinforcement is provided in the bead (30A), for example axially parallel longitudinal filaments (39) and circumferential filaments (39') wound thereon (figure 9) or a woven fabric.
10. The flexible press cover as claimed in one of claims 1 to 7, characterized in that the additional strengthening is formed of additional

circumferential filaments (32') which form a continuation of the conventional circumferential filaments (32), for example with increased winding density and/or increased filament thickness (figure 10).

11. The flexible press cover as claimed in one of claims 1 to 5, characterized in that the additional reinforcement has at least one band, for example a woven fabric band.
12. The flexible press cover as claimed in one of claims 1 to 11, characterized in that the end region (E) having the additional strengthening (34) has a greater thickness (d, figure 1) than the adjacent press cover region.
13. The flexible press cover as claimed in one of claims 1 to 5, characterized in that the additional strengthening means has a strengthening ring (51; 51A; 61; 71, 72) prefabricated from a plastic or a metal.
14. A flexible press cover (10), which is intended for a shoe press roll - used for dewatering or calendering a moving fibrous web - and which has a plastic layer (30) and, as a strengthening means, a "conventional" reinforcement (31, 32) embedded therein, the press cover (10) having, at least in one of its two end regions (E), an additional strengthening means (34) in the form of a strengthening ring (51; 51A; 61; 71, 72) prefabricated from a plastic or a metal, which makes the press cover suitable to be fixed to a rotatable supporting element (for example a spreader ring 27) of the shoe press roll, preferably on the outer circumferential surface of the supporting element, in particular as claimed

in claim 13, characterized in that, as viewed in cross section through the strengthening ring, at least part of the strengthening ring is cast into the press cover.

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15. The flexible press cover as claimed in claim 14, characterized in that the strengthening ring is anchored in the press cover with the aid of reinforcing filaments (56; 64, 66; 74, 76).

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16. The flexible press cover as claimed in claim 14 or 15, characterized in that the strengthening ring (51, 51A) is cast in following the casting of the conventional plastic layer.

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17. The flexible press cover as claimed in claim 14 or 15, characterized in that the strengthening ring (61; 71, 72) is cast in at the same time as the conventional plastic layer is cast.

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18. The flexible press cover as claimed in one of claims 13 to 17, characterized in that the strengthening ring has a flange (67 or 68 or, respectively, 71a, 72a) for fixing the press cover to a rotatable supporting element (for example a cover carrying disk 79, 80) belonging to the shoe press roll.

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19. A shoe press roll, which comprises a flexible press cover constructed in accordance with one of claims 1 to 18 and which, at each end of the roll, has a rotatable cover carrying disk (20) which is mounted on a stationary supporting element, characterized by the following features:

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- a) at least one of the cover carrying disks (20) comprises a clamping ring (24 or 24A) which can be displaced axially on an outer

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- circumferential surface of the cover carrying disk;
- b) the clamping ring has a conical outer surface which engages in a conical inner surface of a ring (27 or 27A) that can be spread;
- c) the ring that can be spread rests in the cover inner surface of the press cover end region (E) having the additional strengthening (34);
- d) the arrangement is free of fixing elements associated with the press cover outer circumferential surface.
20. The shoe press roll as claimed in claim 19, characterized in that the clamping ring (24A) can be displaced axially by means of screws (28).
21. The shoe press roll as claimed in claim 19, characterized in that the clamping ring (24) can be displaced axially by means of a hydraulic pressure chamber (25), as known per se.
22. The shoe press roll as claimed in one of claims 19 to 21, characterized in that the spreader ring (27A) has a collar (27B) for the axial fixing of the press cover (figure 4).
23. The shoe press roll according to the preamble of claim 19, characterized in that, at at least one of the ends of the roll, in order to connect the press cover (10B; 10C) to the cover carrying disk (20B; 20'), a mounting ring (40, 40') is provided which, outside the press roll, can be inserted into the press cover end having additional strengthening (34, 34A) and, after that (together with the press cover), can be fixed to the cover carrying disk (figures 5, 6).

24. The shoe press roll as claimed in claim 23, characterized in that the aforementioned mounting ring (40, 40') has a conical outer circumferential surface matching a conical inner circumferential surface of the press cover end region having the additional strengthening (34; 34A).
25. The shoe press roll as claimed in claim 23, characterized in that the mounting ring has a substantially cylindrical outer circumferential surface.
26. The shoe press roll as claimed in one of claims 23 to 25, characterized in that the mounting ring (40') can be inserted into an end region of the press cover which is tapered conically outward (as claimed in claim 25 or 26) (figure 6).
27. The shoe press roll as claimed in one of claims 23 to 26, characterized in that the mounting ring (40, 40') has a collar for the axial fixing of the press cover.